DETAILED DESCRIPTION OF INVENTION

The following examples serve to illustrate the present invention without, however, limiting the same thereto.

Example 1

The lenses are removed from 50 eyes of recently slaughtered hogs under proper hygenic conditions and are decapsulated. The more liquid peripheral part of said lenses is then separated from the more solid inner part or nucleus of said lenses by shaking on a coarse sieve. The nuclear part of the lenses is slowly and gradually dried at a temperature of 40° C. in an atmosphere the humidity of which is gradually reduced in such a manner that it is at any given moment only a fraction below the water content of the nuclear lens material. When proceeding in this manner and carefully drying the lens material, a dried gel of a solids content of about 80% which is free of cracks, fissures, and holes is obtained. The resulting dried gel in which substantially no denaturation of the protein has taken place and which contains the protein in the form of its natural oriented filamentary molecules is then molded by pressing it in a biconvex lens-shaped form or in a concavoconvex contact lens form at a temperature of 20–70° C. and under a pressure of about 35 kg./sk. cm. until a fully transparent, solid molded body of the desired optical refractive index is obtained. The resulting molded bodies are stabilized and kept in stock until used as contact lenses or for implantation in the place of operatively removed cataractous lenses.

Example 2

The separated peripheral part of the 50 lenses used in Example 1 is dialyzed against distilled water until free of dialyzable components. The dialyzed material is then placed into an aqueous urea solution and is homogenized therein yielding a clear viscous sol or paste of a solids content of 10% to 60%. Any undissolved matter is removed by centrifuging.

The sol is filled into an ion-permeable cellulose acetate membrane having the shape of the desired lens or contact lens. The cellulose acetate membrane mold is immersed into an aqueous 0.1 N cadmium nitrate solution. Diffusion of the cadmium ions through the porous membrane gradually builds up an ionotropic clear and fully transparent gel in which the fibrillas and bundles of fibrillas of the lens protein are oriented and form the desired anisotropic gel structure. As soon as gel formation is completed, the membrane mold is removed from the cadmium nitrate solution and is placed into an 0.1 N citric acid solution. By repeatedly changing the citric acid solution, the cadmium ions are exchanged against hydrogen ions. Excess hydrogen ions are removed by subjecting the gel to dialysis or electrodialysis. The resulting lens-shaped gel consists of a body of oriented filamentary protein molecules.

Example 3

The procedure is the same as described in Example 2. However, in place of the peripheral part of lenses of eyes of hogs, there is used the peripheral part of the lenses of eyes of cattle, in place of lithium thiocyanate solution an aqueous 0.1 N lithium hydroxide solution, and in place of cadmium nitrate solution, an aqueous N cupric nitrate solution. The mold is composed of an ion-permeable alginate membrane.

Example 4

The procedure is the same as described in Example 2. However, in place of the peripheral part of lenses of eyes of hogs, there is used the peripheral part of the lenses of eyes of horses, in place of lithium thiocyanate solution an aqueous N lactic acid solution, and in place of cadmium nitrate solution, an aqueous N zinc chloride solution. The mold is composed of an ion-permeable cellulose nitrate membrane.

Example 5

The procedure is the same as described in Example 2. However, in place of the peripheral part of lenses of eyes of hogs, there is used the peripheral part of the lenses of eyes of cattle, in place of lithium thiocyanate solution an aqueous 15% urea solution, and in place of cadmium nitrate solution, an aqueous 0.1 N calcium chloride solution. The mold is composed of an ion-permeable pectinate membrane.

Example 6

20 decapsulated lenses of cattle are placed into an aqueous 0.1 N sodium hydroxide solution and the mixture is homogenized by stirring, thereby yielding a clear viscous sol of a solids content of 20%. This sol is freed of undesired components which might unfavorably affect gel formation, by dialysis against distilled water and is centrifuged.

Glycerol is added to the sol in an amount of 15% of the sol and the resulting mixture is filled into the middle chamber of a three-cell electrodialyzer according to Thiele. The membranes forming said middle chamber are shaped so that they impart to the resulting gel the shape of the desired biconvex lens or concavoconvex contact lens. On applying thereto a direct current voltage of 5 volts, the electrolytes and a considerable part of the water are removed and the sol is converted into a clear ionotropic gel of the desired shape.

Example 7

Cross-linking and stabilizing lenses as produced according to the preceding examples is carried out by immersing the lens into a 50% aqueous solution of glycerol containing 0.4% formaldehyde at 25° C. for about 6 days. The mixture of glycerol and formaldehyde is changed every 8 hours whereby the formaldehyde content is increased by 0.1% each time the solution is changed. The final formaldehyde solution contains about 2.0% of formaldehyde. Thereafter excess formaldehyde is removed, and the gel is kept humid..

In place of glycerol, there may be used other polyhydric alcohols such as ethylene glycol, or polyglycols while formaldehyde may be replaced by other cross-linking agents as mentioned hereinabove.

Of course, many changes and variations in the starting eye lens material, in the solubilizing agents, the gel-forming agents, and the cross-linking and stabilizing agents used, in the conditions, temperature, and duration employed for dissolving the natural starting material, for forming the ionotropic gels, in the manner in which the reconstituted lens material is shaped, and the like may be made by those skilled in the art in accordance with the principles set forth herein and in the claims annexed hereto.

We claim:

1. In a process of producing shaped optical bodies useful as aids to vision, the steps which comprise:

(a) dissolving lenses of eyes of warm-blooded animals and humans in aqueous solutions of agents increasing the solubility of the lens proteins but without detrimentally affecting and denaturing the same,

(b) causing gel-forming ions to diffuse into the resulting colloidal solution to produce an ionotropic gel with oriented filamentary protein molecules,

(c) shaping the gel to the shape of the desired optical body useful as aid to vision, and

(d) partly dehydrating and corss-linking the shaped gel.

2. The process according to claim **1**, wherein in step (a) the peripheral part of the lenses is used for preparing a colloidal solution therof.

3. The process according to claim **1**, wherein in step (a) the agents increasing the solubility of the lens protein are agents selected from the group consisting of acids, alkaline agents, urea and its derivatives, and salts which